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| 09/724,633 | 11/28/2000 | David Bakker | 4616 US | 7867 |

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| EXAMINER |
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CARTER, AARON W

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| ART UNIT | PAPER NUMBER |
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2625

DATE MAILED: 05/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/724,633

Applicant(s)

BAKKER ET AL.

Examiner

Aaron W. Carter

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 September 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 September 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. This action is responsive to papers filed on September 24, 2004.

Response to Amendment

2. In response to applicant's amendment received on September 24, 2004, all requested changes to the claims have been entered. Claims 41-44 have been added.

Response to Arguments

3. Applicant's arguments filed September 24, 2004 have been fully considered but they are not persuasive.

4. Applicants argue that Lin (already of record) does not teach or fairly suggest classifying, by the data processing system, at least one of the plurality of images in accordance with the extracted features and classes of the training set, the classifier grouping the plurality of images before receiving feedback from a human being.

Examiner disagrees. The invention of claim one details extracting features from a training set that is a user-chosen subset of the plurality of images, each image in the training set having an associating class. As discussed in the previous action Lin discloses this limitation in column 20, lines 16-20. This limitation states that the user has chosen a subset of the plurality of images for the training set and the extracted features and associated classes from this training set are used for classifying by the data processing in the next limitation. The next limitation stating,

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classifying, by the data processing, at least one of the plurality of images in accordance with the extracted features and classes of the training set, the classifier grouping the plurality of images before receiving feedback from a human user. Examiner understands this last limitation to not include the feedback from the user that was taken in the previous limitation for providing a subset of the plurality of images, which was used in this classifying step. As stated in the previous action Lin discloses this limitation in column 21, lines 16-20, wherein the defects of an image are classified based on their extracted features compared to the extracted features defects in the training set. According to Figure 39 and column 30, lines 1-26, after the defect is classified by the system or data processor which occurs before feedback from a human user, the system may then asks the user if the classification is correct, this corresponding the next limitation of allowing the user to classify ones of the plurality of images. Using the broadest reasonable interpretation of the claims, examiner feels that the prior art of Lin discloses the limitations disclosed in claims 1, 20, 21 and 40. Please refer to the rejection below for further explanation.

5. Applicants argue that Lin does not teach or fairly suggest a software portion configured to allow a user to classify ones of the plurality of images and further configured to send feedback to an inspection system to fine-tune the inspection system in accordance with the user's classification.

Examiner disagrees. Lin discloses allowing the user to classify ones of the plurality of images in Figure 39, element 598 and column 30, lines 15-16 and is configured to send feedback to an inspection system to fine-tune the inspection system in accordance with the user's

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classification in Figure 39, wherein the system compares its classification to the user's classification (598) if they match and classification is correct the training set is updated (606). This corresponds to fine-tune the system in accordance with the user's classification.

6. Applicants argue that there is no motivation for the combination of Lin and Kohonen or Lin and Karnowski.

Examiner disagrees. Lin discloses the use of pattern recognition to classify defects and Kohonen and Karnowski teach methods of making pattern recognition more efficient as discussed in the rejections below.

Drawings

7. The drawings were received on September 24, 2004. These drawings are accepted.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 1-20, 40-42 and 44 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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Claims 1, 20 and 40 recites the limitation "grouping" in line 7 for claims 1 and 20 and line 8 for claim 40. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

11. Claims 1-9, 13-29 and 33-44 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent 6,292,582 to Lin et al. ("Lin").

As to claims 1, 20, 21 and 40, Lin discloses a method/system implemented by a data processing system for classifying a plurality of received images, comprising:

Extracting features from a training set that is a user-chosen subset of the plurality of images, each image in the training set having an associated class (column 20, lines 16-20, wherein an expert operator chooses a subset of defect images from a plurality of images and these images are classified based on their extracted features);

Classifying, by the data processing system, at least one of the plurality of images in accordance with the extracted features and classes of the training set, the classifier grouping the

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plurality of images before receiving feedback from a human being (column 21, lines 26-52 and Figure 39, elements 590-596);

Allowing a user to classify ones of the plurality of images (Fig. 39, element 598 and column 30, lines 1-26); and

Displaying the results of a comparison between the classification by the data processing system and the classification by the user (column 30, lines 27-48 and column 7, lines 2-6).

As to claims 2 and 22, Lin discloses the method/system of claims 1 and 21 wherein the features of the training set include size (column 20, lines 1-5).

As to claims 3 and 23, Lin discloses the method/system of claims 1 and 21, wherein the features of the training set include brightness (column 20, lines 1-5).

As to claims 4 and 24, Lin discloses the method/system of claims 1 and 21, wherein the features of the training set include color (column 20, lines 1-5).

As to claims 5 and 25, Lin discloses the method/system of claims 1 and 21, wherein the features of the training set include shape (column 20, lines 1-5).

As to claims 6 and 26, Lin discloses the method/system of claims 1 and 21, wherein the features of the training set consist at least one of:

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Texture, moment of inertia, context, proximity to wafer features, proximity to other defects, connectivity to adjacent features, connectivity to other defects, and yield relevant properties derived from the image (column 20, lines 1-5, texture).

As to claims 7 and 27, Lin discloses the method/system of claims 1 and 21, wherein the features of the training set include defect coordinates in wafers (column 17, line 62 – column 18, line 5, defect location).

As to claim 8 and 28, Lin disclose the method/system of claims 1 and 21, wherein the features of the training set include defect coordinates when spatial cluster analysis is used (column 6, lines 2-6).

As to claim 9 and 29, Lin disclose the method/system of claims 1 and 21, wherein the features of the training set include information derived from one of the processing history, yield, relevance, and origins of defects (column 7, lines 24-38).

As to claim 13 and 33, Lin discloses the method/system of claims 1 and 21, where classifying, by the data processing system, at least one of the plurality of images further includes classifying in accordance with cluster-based features instead of images (column 6, lines 2-6).

As to claims 14 and 34, Lin discloses the method/system of claims 1 and 21, wherein allowing a user to classify ones of the plurality of images includes displaying the images to the

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user in classification groups determined by the classifying step (column 30, lines 15-16 and column 7, lines 2-6).

As to claims 15 and 35, Lin discloses the method/system of claims 1 and 21, further comprising sending feedback to an inspection system to fine-tune the inspection system in accordance with the user's classification (column 30, lines 49-54).

As to claim 16 and 36, Lin discloses the method/system of claims 1 and 21, further comprising:

Inspecting an inspection object in real-time and sending the results of the inspection set to a classifier trained in accordance with the plurality of images classified by the user (column 21, lines 26-28).

As to claims 17 and 37, Lin discloses the method/system of claims 1 and 21, wherein the features include tool history information relating to an inspection system (column 7, lines 24-38 and column 8, lines 5-8).

As to claims 18 and 38, Lin discloses the method/system of claims 1 and 21, wherein the features include tool history information relating to the past success rate of the classification step (column 7, lines 24-38 and column 8, lines 5-8).

As to claims 19 and 39, Lin discloses the method/system of claims 1 and 21, wherein only some of the plurality of images relate to a semiconductor etch process (column 17, lines 23-48).

As to claim 41, Lin discloses the method of claim 1, wherein the plurality of images are images captured during a semiconductor manufacturing process (column 1, lines 36-51).

As to claims 42-44, please refer to the rejection of claim 41 above.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 10, 11, 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin as applied to claims 1 and 21 above, and further in view of an article entitled "The Self-Organizing Map" by Kohonen (already of record).

As to claims 10 and 30, Lin discloses the method/system of claims 1 and 21, but neglects to explicitly disclose where classifying, by the data processing system, at least one of the plurality of images in accordance with the extracted features and classes of the training set includes classifying the plurality of images using a Kohonen map technique. However, Kohonen

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teaches us that the use of his self-organizing map on artificial neural networks effectively creating spatially organized “internal representation” of various features of input signals and their abstractions (Abstract). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the classifying method/system disclosed by Lin with the teachings of Kohonen, this providing a successful, self-organizing system (Abstract).

As to claims 11 and 31, the combination of Lin and Kohonen disclose the method/system of claims 10 and 30, Kohonen further discloses wherein the Kohonen map is seeded with non-random numbers (page 1465, column 2, section C, lines 6-8, wherein random will suffice, however leaving the it an option, wherein non-random initialization can also be used).

14. Claims 12 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin as applied to claims 1 and 21 above, and further in view of an article entitled “The Application of Spatial Signature Analysis Electrical Test Data Validation Study” by Karnowski et al. (“Karnowski”)(already of record).

As to claims 12 and 32, Lin discloses the method/system of claims 1 and 21, but neglects to explicitly disclose where classifying, by data processing system, at least one of the plurality of images in accordance with the extracted features and classes of the training set includes classifying the plurality of images using a spatial signature analysis technique. However, Karnowski teaches us the use of spatial signature analysis in relation to defect classification (page 1, section 2). Therefore it would have been obvious to one of ordinary skill in the art at

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the time of the invention to combine the classifying method/system disclosed by Lin with the teaching about spatial signature analysis disclosed by Karnowski. This would provide the invention with intelligent data reduction with providing timely feedback on current manufacturing processes (page 1, section 2).

Conclusion

15. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron W. Carter whose telephone number is (571) 272-7445. The examiner can normally be reached on 8am - 4:30 am (Mon. - Fri.).

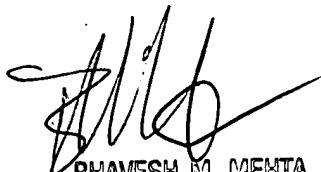
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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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